



NEWSLETTER

of the Introduced Fish Section  
American Fisheries Society

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Hiram W. Li, Editor

Volume 10, Number 4

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FROM THE PRESIDENT AND THE EDITOR

We have had a fun time exchanging ideas with each other over the issue of the introduction of exotics species. We didn't know what to expect from each other except that we had differing viewpoints. During the course of the past year and a kazillion dollars (in Carl Sagan's units) in telephone bills, we have grown to respect each other and become friends. We still differ in philosophy, Hiram is much more conservative in his thinking than Paul concerning purposeful introductions; but we are in total agreement concerning the problems caused by accidental releases and bait bucket transfers. Paul is very insistent that we don't act alarmist unless we have evidence to suggest that problems of purposeful introductions are highly probable. Hiram believes that the use of exotics is the very last resort in management and that very thorough regional studies in experimental systems be conducted before the use of exotics is even proposed. Both points of view have validity. The differences in points of view in exotic species management reflect a lack of knowledge and principles as well as personal philosophies. Therefore it is important that this debate continue in this forum.

Hiram has asked Paul to continue a column presenting his point of view and Paul has suggested that two columns become regular features in IFS Newsletters. We brainstormed over the names to give the columns. We wanted the names to reflect the general points of view, but were afraid that if the names were inappropriately chosen, people would be divided into camps. We want ideas reflecting different viewpoints, but we also hope for resolution of some issues. Those that cannot be resolved are obvious places for study and research (philosophical, ethical, and biological). The membership is composed of good people, we've perused the list. Let's hear from you. Can you think of good names for the column? Will you participate in a guest column periodically (maybe this newsletter will be so prestigious that you will be promoted on the basis of citing your contributions to it in your next merit review)? In our worst nightmare the columns would be entitled "Isolated-pointy head-dickey fish-academics" vs. "Ignorant-insensitive-management yahoos". That gets real ugly. Help us. We need input.

Prizes for best names will be supplied by Walt Courtenay, Peter Moyle, John Cassani and Jim Seeb who have graciously offered to buy the most expensive, top-of-the-line BMW luxury sedans equipped with the finest, most expensive sound systems complete with CDs of Mozart's or Vanilla Ice's biggest hits

(your choice). Thanks guys (contest not valid where prohibited by law or constraints of reality).

-Paul Shafland and Hiram Li-

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"Enquiring Minds Want to Know: what's the stink over smelt?"

Manitoba

Correspondent: A.J. Derksen<sup>1</sup>

The IFS newsletter 10(1) reported that the rainbow smelt had invaded Lake Winnipeg. That rumor proved to be false, the fish was in the drainage, but several hundred miles away as of May 15 and May 22 1990, the dates of the letters correcting my mistake. A new letter from A.J. Derksen dated 10 December 1990 reports that two confirmed specimens of smelt were caught by commercial fishermen from Lake Winnipeg. Smelt have spread into the Rainy River system, having been found in Namakan and Rainy lakes.

Elsewhere (AKA, Ontario) the smelt is being accidentally dispersed by fishermen. The scene is reminiscent of the movie "Revenge of the Living Dead"; according to Neville Ward of Ontario's Ministry of Natural Resources, "The spread of smelt into the Northwest is the result of anglers bringing these fish back and allowing the remains of cleaned smelt, including fertilized eggs, to be washed into nearby lakes and streams" (The Times-News Northwest, 1 May 1989; Daily Miner and News, 22 April 1988). They are established in Red Lake and perhaps Gull Lake as well (The District News 27 April, 1988). The rainbow smelt has been implicated in the decline of coregonids as an egg predator and may compete for zooplankton with the young-of-the-year of other species.

1. Fisheries Branch, Fish Habitat Management, Box 40, 1495 St. James Street, Winnipeg, Manitoba. R3H 0W9.

#### References

Daily Miner and News. 1988. Smelts could threaten northwestern Ontario fishing. 22 April.

The District News. 1988. Smelt pose a threat to district lakes. 27 April.

The Times-News Northwest. 1989. Smelt ban considered. 1 May 1989.

## SMELT THREATEN NORTHWESTERN ONTARIO FISHERMEN

Smelts have accidentally found their way into some Northwestern Ontario lakes and streams. These small silvery fish are harmful to native fish populations such as Walleye, Lake Trout and Whitefish.

THEY MUST BE STOPPED

If you fish for smelt:

- Don't wash smelt containers in lakes or creeks - they may contain fertilized eggs;
- Don't clean smelt in a sink that drains directly into a lake; and
- Bury smelt guts and container residue well back from the water.

HELP MANAGE YOUR FISHERY



MINISTRY OF  
NATURAL  
RESOURCES

Ontario

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#### Legislation

H.R. 5852 was introduced in the House of Representatives on October 17, 1990, which was referred to the Committee on Merchant Marine and Fisheries. The complete text is as follows:

### A BILL

To minimize the risk of adverse impacts from the intentional introduction of fish and wildlife into ecosystems to which they are not indigenous.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

#### SECTION 1. SHORT TITLE.

This Act may be cited as the "Species Introduction and Control Act of 1990."

#### SEC. 2. DEFINITIONS.

For the purposes of this Act-

(1) The term "control" means efforts to eradicate, substantially reduce the population of, and prevent the spread of a nonindigenous species or develop means of adapting human activities and infrastructure to accommodate infestations.

(2) The term "ecosystem" means the system, often expressed in terms of drainage basins, consisting of communities of plant, animals, bacteria, and other species and the physical and chemical environment with which they are interrelated.

(3) The term "established" means species occurring in open habitat as a reproducing, self-sustaining population.

(4) The term "fish" means finfish, mollusks, crustaceans, and all other aquatic organisms other than marine mammals and birds.

(5) The term "wildlife" means any member of the animal kingdom, and any egg or offspring thereof, including any mammal, bird, amphibian, reptile, non-aquatic mollusk, nonaquatic crustacean, nonaquatic arthropod, or other nonaquatic invertebrate while excluding domesticated animals.

(6) The term "introduction" means placing a species or causing a species to be placed, into an ecosystem to which it is not indigenous, including any importation of species not indigenous to North America into the United States and their transport within the United States and the transport of North American species into an ecosystem where they are not indigenous nor previously established.

(7) The term "indigenous" means native to an ecosystem.

(8) The term "species" means organisms, including viable genetic material, that have a high degree of similarity physically and genetically, can generally interbreed only among themselves, and show persistent differences from members of allied species, but may include subspecies, populations or other taxonomic classifications less than full species.

(9) The term "States" means the agency, board, commission or other governmental entity in each of the political units that together constitute the United States of America which is responsible for the management and conservation of the fish and wildlife resources in that political movement.

#### SEC. 3. GENERAL REQUIREMENTS TO MINIMIZE THE RISK OF ADVERSE IMPACTS FROM THE INTRODUCTION OF NONINDIGENOUS FISH AND WILDLIFE SPECIES

No entity may introduce a fish or wildlife species into an ecosystem to which the species is not indigenous unless-

(a) that entity submits a proposal for such introduction to the Secretary of Interior, acting through the Director of the United States Fish and Wildlife Service (hereafter in this Act when so acting referred to as the "Secretary");

(b) the protocols established under section 4 and procedures required under section 5 are followed; and

(c) the states likely to be affected by the introduction approve the introduction.

#### SECTION 4. DEVELOPMENT OF PROTOCOLS TO MINIMIZE THE RISK OF ADVERSE IMPACTS FROM THE INTRODUCTION OF NONINDIGENOUS FISH AND WILDLIFE SPECIES.

Within one year after the date of enactment of this Act, the Secretary, in consultation with the National Marine Fisheries Service, interstate marine fisheries commissions, States, and other entities concerned with the conservation and management of fish and wildlife shall develop one or more protocols that shall be the basis for evaluating proposed introductions of fish and wildlife species into ecosystems to which they are not indigenous by individuals, governmental agencies, or profit or nonprofit organizations. Such protocols shall require several sequential steps prior to introduction of any species, including-

(a) the establishment of the objective to be achieved by the introduction and identification of all species, that could be used to achieve that objective;

(b) compilation and review of all scientific information about the species under consideration, field studies in native and other habitat and laboratory studies of likely interactions with species and ecosystems within the potential range of the species;

(c) development of monitoring and control programs; and

(d) test introductions in confined ecosystems. Such protocols shall provide for full scientific peer and public review of and comment on all findings, conclusions, and recommendations. The protocols shall also provide for acceptance or approval of all findings, conclusions, or recommendations by scientific peers, the States or others, as appropriate, after completing each stage of the evaluation process.

#### SEC. 5. PROCEDURES FOR IMPLEMENTING PROTOCOLS.

(a) SUBMISSION OF PROPOSALS.- Any entity, including an agency of the Federal Government or a State, may submit a proposal for the introduction of fish and wildlife species into ecosystems to which they are not indigenous for approval as provided for in this Act. Proposals shall be submitted to the Secretary and shall-

(1) contain an explicit statement of the objectives to be achieved by the proposed introduction of a species into an ecosystem,

(2) identify all indigenous and nonindigenous species which could be introduced in lieu of the species proposed to be introduced and still accomplish the objectives for introduction referred to in paragraph (1),

(3) include a compilation and review of the literature on the species proposed for introduction and on all species identified in response to the requirements of paragraph (2), and

(4) provide such other information as the Secretary may require.

(b) PUBLIC REVIEW AND COMMENT.-A notice of receipt of each proposal submitted under subsection (a) and a request for public comments and scientific peer review of the completeness of the information provided and assessments of the potential impacts of the species under consideration for introduction on North American species and ecosystems shall be published in the Federal Register. The Secretary shall provide a period of not less than sixty days from the date of such publication for comment on the proposal.

(c) DETERMINATION OF PROPOSED SPECIES POTENTIAL RANGE IN NORTH AMERICA.- Within thirty days of the close of the comment period required under subsection (b) and after taking into consideration any comments received and all available scientific information, the Secretary shall make a determination of the area within North America that the species under consideration would likely occupy if they became established. The Secretary shall periodically revise this determination as necessary. The Secretary shall promptly notify the States within the potential range of species under consideration of the initial determinations and any subsequent modifications and their role in evaluating and approving proposed introductions.

(d) APPLICATION OF PROTOCOLS.-The Secretary shall ensure that-

(1) protocols appropriate to the species under consideration are employed by the proponents of an introduction to provide a basis for evaluating the risk of adverse impacts if those species were introduced,

(2) opportunities for State, Federal, scientific peer, public or other review of all findings, conclusions and recommendations are provided at appropriate stages in the evaluation process, and

(3) procedures are established for the acceptance or approval of findings, conclusions and recommendations by appropriate entities.

(e) MONITORING AND CONTROL PROGRAMS.-Prior to undertaking actions that might result in the introduction of nonindigenous species, the proponents of an introduction shall put into place and maintain capabilities for-

(1) the timely detection of any species that becomes established as a result of those actions and for continually monitoring the behavior and dispersal of established species and providing timely information about deviations from the projected behavior and distribution, including adverse impacts on the ecosystem and other species, and

(2) effectively controlling any species that becomes established as a result of those actions wherever they might become established.

If a species becomes established prior to a decision to allow the introduction of a species in accordance with the provisions of this Act, the Secretary shall require the proponents to promptly institute control activities and eradicate the species from open ecosystems. If a species introduced in accordance with the provisions of this Act does not behave as projected, the Secretary shall determine whether that species is having a significant adverse impact and, if so, require the introducers and any other entities that have, or have caused to have, the species imported or introduced to promptly initiate effective control actions.

(f) STATE APPROVAL OF INTRODUCTIONS.-States within the potential range of the species under consideration must approve by written notice to the Secretary, all actions that might result in the introduction of those species into open ecosystems.

#### SEC. 6. PENALTIES.

(a) CIVIL.-Whoever violates any provision of this Act shall be liable for a civil penalty in an amount not to exceed \$25,000. Each day of a continuing violation constitutes a separate violation.

(b) CRIMINAL.-Any person knowingly violates any provision of this Act is guilty of a class C felony.

Thanks to Dennis Lassuy<sup>2</sup> for keeping the IFS membership informed.

2. U.S.F.W.S., Endangered Fishes, 2600 S.D. 98th Ave., Suite 100  
Portland, OR 97266

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"Wanted Dead but Not Alive"

Washington

Correspondent: Doug Fletcher<sup>3</sup>

Thanks also to Pete Bisson<sup>4</sup> for providing me with a copy of the review.

The State Wildlife Commission approved the recommendation of the Washington Department of Wildlife to expand the list of deleterious species prohibited by the state as of 11 January 1991. The list includes the following: (1) any member of the family Clariidae; (2) snakeheads, family Channidae; (3) piranhas; (4) gars, family Lepisosteidae; (5) bowfin, *Amia calva*; (6) the ide, *Idus*; (7) the rudd, *Scardinius erythrophthalmus*; and the mute swan. Present pets will not be confiscated, but owners must register them within two months. Failure for compliance is 90 days in jail and fines up to \$500. These organisms may not be sold other as meat. Live specimens may be sold out of state only with the permission of the Director of the Department of Wildlife, the responsible agency in that state and biologists from both agencies. Propagation and transport of these organisms within the state is strictly prohibited.

The following were abstracted from the review by the Washington Department of Wildlife concerning the reasons these species were imported into the state and for their prohibition.

bowfin (*Amia calva*)

This fish is likely to survive within the state, can grow to large sizes and is highly predacious and may have significant deleterious impact on the native fauna. About 6 per year are sold from one pet store to the aquarium trade at an average price of \$14 each. The bowfin is banned from the states of AZ, CA, CO, CT, NV, UT, WY and the province of British Columbia.

piranhas (*Serrasalmus*, *Rooseveltiella*, and *Pogonias*, family Characidae, subfamily Serrasalminae)

Fishes in this group are predaceous and can lower fish production by 50% or more in bodies of water in which it exists. Dr. Axlerod, author of some authoritative publications on piranhas, states that there definitely are some coldwater strains of piranhas. Some of these strains come from Paraguay. Some scientists have reported thin ice cover over Lake Ypacarai, as well as the oxbows of the Rio Feticuary with no loss of piranha in those areas during cold weather. Another fisheries worker noted similar survival in the Jaura River, a tributary of the Paraguay River, during similar conditions. A Mr. DeMagalhães, in correspondence to a California biologist, describes conditions in the Sao Paulo area where piranhas survived even when water temperatures dropped to 7 to 8°C. Piranhas are imported only for aquarium use. Several pet dealers remarked that a large proportion of piranhas are bought by people with a fascination for the macabre nature of these fish, some who want to "fight" the fish, some who want to watch them kill and eat other fish, and so on [editor's note: the same people who wear goal keeper's masks and carry chain saws]. During the fall of 1989 and the spring of 1990, an average of 211 piranhas were sold per month at an average price of \$7.03 per fish. It became clear during visits to the Vancouver stores that many people are buying and illegally transporting piranhas south from Washington into Oregon and California. One or more species are banned from the states of AL, AR, AZ, CA, CO, CT, FL, GA, KY, ME, NC, NH, NM, NV, NY, OK, OR, SC, TX, UT, VA, WA, WY.

walking catfishes (Family Clariidae)

Aggressive predator that may survive in the state of Washington as research has shown it can survive temperatures down to 4.4°C. Albino forms of *Clarias batrachus* was imported as part of the pet trade, but has been prohibited from the state for some time. The new ordinance expands the prohibition to all members of the family. All members are consider an injurious species by the U.S. Fish and Wildlife Service and importation into the U.S.A. is prohibited. They are banned from the following states: AL, AZ, AR, CA, CO, CT, FL, GA, IL, IN, KS, KY, LA, ME, NV, NH, NM, NC, OH, OR, SC, TN, UT, VA, WA, WY.

rudd (*Scardinius erythrophthalmus*)

This fish's diet has high potential for overlap with native fishes, is hardy, prolific, and is likely to thrive in the state of Washington. Originally, imported for ornamental purposes, it has become a popular baitfish for largemouth and striped bass, but as yet has not been brought into the state. This species is known to carry *Rhabdovirus carpio*, has become established in

AK, IL, KS, MA, MO, NY, OK, TX, VA, WI and is banned from AL, AR, CT, LA, MI, TX, VA and the province of British Columbia.

ide (*Leuciscus idus*)

This is a hardy fish, almost certain to survive and reproduce in Washington. It might compete with more valuable fish for food, as well as prey on the eggs and young of other fish. It can be a carrier of *Rhabdovirus carpio*. It has been used as forage for predatory fish at hatcheries in the southeastern United States. Arkansas fish growers have been raising and exporting this species for bait. It is highly valued as an ornamental fish because of its vivid red or orange-gold coloration. It has not been imported as yet into the state, but is banned from AL, AZ, CA, CT, FL, NV, NM, UT, WY and the province of British Columbia.

gar-pikes (Family Lepiosteidae)

Large, predaceous, likely to survive in Washington, carries an ectoparasite *Argulus*, and the diseases: pike fry rhabdovirus, and pike epidermal proliferation. Sold in only seven out of 30 pet stores at a rate of 45 fish a year at an average price of \$21.40 each. Banned from AZ, CA, CO, CT, NV, NM, UT, WY and the province of British Columbia.

snakeheads (genus *Channa*)

Highly aggressive and predaceous fish, can survive water temperatures down into the 50's°F. They are carriers of the disease, snakehead rhabdovirus. Sold for aquarium use in 13 of 30 pet stores at a rate of 285 fish per year at an average price of \$10.44 per fish. Banned from AZ, CA, CO, FL, GA, KY, NV, NM, OK, TX, UT, and WY.

3. Warmwater Fish Program Manager, Washington Department of Wildlife, 600 Capital Way, North Olympia, WA 98501-1091.

4. Weyerhaeuser Company, Weyerhaeuser Technology Center, WTC 2F19, Tacoma WA 98477.

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Have you seen..... Peter Moyle, Reference Sleuth

Arthington, A.H. 1989. Impacts of introduced and translocated freshwater fishes in Australia. Pages 7-20, in S.S. DeSilva (ed.). Exotic aquatic organisms in Asia. Proceedings of the Workshop on introduction of exotic aquatic organisms in Asia. Asian Fish. Soc. Spec. Publ. 3. Asian Fisheries Society, Manila, Phillipines, 154 pp.

**Abstract:** Australian inland waters have been successfully colonized by 19 freshwater species introduced to the continent, including 5 salmonids, a percid, 5 cyprinids, 6 poeciliids, and 3 cichlids. Some of these introductions have been beneficial but the aim of this chapter is to review the ecological consequences of fish introductions, both planned and unintentional, in terms of possible adverse impacts on freshwater biota and ecosystems. Such impacts may include hybridization between species, sub-species and genetic strains, habitat and water quality alterations, competition, predation and the introduction of parasites and diseases. An account of the translocation of four endemic Australian fishes into Lake Eacham, Queensland is also included because these translocations appear to have caused the extinction of the endemic rainbowfish unique to the lake, chiefly as a result of predation. Conspicuous gaps in knowledge of introduced species in Australia and research priorities are highlighted. The final section outlines areas of ecological theory that may assist in predicting the impacts of species introductions, i.e., the theory of island biogeography, the concept of limiting similarity and the analysis of food webs.

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Arthington, A.H. 1989. Diet of *Gambusia affinis holbrooki*, *Xiphophorus helleri*, *X. maculatus* and *Poecilia reticulata* (Pisces: Poeciliidae) in streams of southeastern Queensland, Australia. Asian Fisheries Science 1:000-000

**Abstract:** The diet of four introduced Poeciliidae, *Gambusia affinis holbrooki*, *Xiphophorus helleri*, *X. maculatus* and *Poecilia reticulata*, were studied in subtropical streams, southeastern Queensland, Australia. The prey of greatest importance in *G. affinis* diets usually of terrestrial origin,

ie.e. ants and adult nematoceran Diptera, but aquatic Hemiptera and other aquatic taxa were also important in some habitats. G. affinis ate invertebrate prey that were small relative to body size and mouth gape (mean prey width 0.3 x mouth gape, mean prey length 1.28 x mouth gape) and relative to the range of prey present (mean prey ingested = 0.597 x mean length and 0.702 x mean width of available prey in the environment equal to or smaller than the largest prey eaten). Some aquatic taxa (e.g., immature Trichoptera and Ephemeroptera, Oligochaeta, Crustacea and Mollusca) of the preferred size range which were abundant in the streams were eaten infrequently. X. helleri was omnivorous, consuming aquatic plant tissue, filamentous and other algae and aquatic and terrestrial invertebrates. X. maculatus consumed Crustacea and aquatic and terrestrial insects with dominance of the atyid shrimp, Caridina. P. reticulata had a more diverse diet composed largely of terrestrial insects, particularly ants; chironomid larvae were the dominant aquatic taxon eaten. The four species of poeciliids had significantly different mean diet composition. The implications of poeciliid feeding for sympatric endemic fishes are briefly discussed.

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Beall, E., M. Heland, and C. Mary. 1989. Interspecific relationships between emerging Atlantic salmon, Salmo salar, and coho salmon, Oncorhynchus kisutch, juveniles. Journal of Fish Biology 35(Supplement A):285-293.

**Abstract:** Interspecific relationships between Atlantic salmon and coho salmon were studied at early life stages in laboratory and semi-natural stream channels. During emergence, the survival and dispersal patterns were similar for the two species in single or mixed populations. Survival of Atlantic salmon fry was reduced in the presence of older coho fry. However, no predation was observed. Microdistribution differed between the two species, with Atlantic salmon fry more numerous in riffles when coho were present.

Coho juveniles had a pelagic and gregarious distribution, in contrast to the benthic behaviour of the Atlantic salmon. In laboratory streams, Atlantic salmon fry moved out or adopted a subordinate cryptic behaviour which allowed them to escape predation while negatively affecting their growth.

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Hengeveld, R. 1988. Mechanisms of biological invasions. Journal of Biogeography 15:819-828.

**Abstract:** This paper considers two alternative hypotheses for explaining biological invasions. One hypothesis, currently prevalent in ecology, is based on the assumption that a 'balance of nature' exists and that biologically function interactions dominate all other factors. An alternative hypothesis assumes that species are independent and respond individually to all factors, their individualism depending on species-specific responses relative to particular factors. The first hypothesis views community composition and external environmental factors as stable; invasions occur either when community resistance ('inertia') is overcome, or when species change genetically so that they can colonize new climatic or biotic environments. The second hypothesis views community composition as flexible and external factors as dynamic. The first is often described using deterministic models, whereas the second emphasizes stochastic ones.

After briefly surveying theories concerning the 'balance of nature'. I describe a stochastic model of range structure and extend it to invasions. This is illustrated by the invasion of the collared dove, Streptopelia decaocto (Friv.), into Europe.

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Laurenson, L.J.B., C.H. Hocutt and T. Hecht. 1989. An evaluation of the success of invasive fish species of the Great Fish River. Journal of Applied Ichthyology 1:28-34.

**Abstract:** There is a worldwide concern over the impact assessment and management of altered ecosystems. Increasingly, attention is being focussed on the role of invasive species in environmental degradation. A practical example of the use of theoretical concepts is presented with particular reference to the invasive species Barbus aeneus, Clarias gariepinus, Astroglanis sclateri and Labeo capensis of the Great Fish River, South Africa. The intrinsic species characteristics of age, growth and reproduction are

presented. The status of the invasion by exotic species and the susceptibility of the environment are described.

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Mandrak, N.E. 1989. Potential invasion of the Great Lakes by fish species associated with climatic warming. Lakes Res. 15:306-316.

**Abstract:** Global warming associated with increasing atmospheric levels of carbon dioxide and other gases (i.e., the greenhouse effect) has been widely predicted. This warming process would likely alter the geographic distribution of numerous fish species in the Great Lakes region. The probability of 58 common, widely distributed species invading the upper Great Lakes (Lakes Huron and Superior) from the lower Great Lakes (Lakes Michigan, Erie, and Ontario), and the lower Great Lakes from the Mississippi and Atlantic Coastal basins was assessed by comparing ecological characteristics of possible invaders to those of 11 recently invading species, using discriminant function and principal components analyses. Twenty-seven of these 58 species were judged to be potential invaders of the Great Lakes as a response to climatic warming. These invading species would dramatically alter the present Great lakes fish communities.

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McKillup, S.C., P.G. Allen, and M.A. Skewes. 1988. The natural decline of an introduced species following its initial increase in abundance; an explanation for Ommatoiulus moreletii in Australia. Oecologia 77:339-342.

**Abstract:** The black Portuguese millipede, Ommatoiulus moreletii, an exotic species first reported in Australia in 1953, shows a pattern of initial eruption and subsequent decline in abundance following its introduction to sites in South Australia. Comparative sampling of new, erupted populations and older, declined populations was done in an attempt to find testable hypotheses to account for the decline. We report on laboratory and field experiments which show that a native rhabditid nematode appears to be the causal agent for the decline of populations of O. Moreletii in south Australia. Implications for the biological control of introduced species are discussed in terms of this work.

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Trendall, J. 1988. The distribution and dispersal of introduced fish at Thumbi West Island in Lake Malawi, Africa. Journal of Fish Biology 33:357-369.

**Abstract:** The rock-dwelling cichlids, or mbuna, of Lake Malawi are exceptionally diverse. Explanations of this diversity have used limited dispersal by the mbuna as the basis for allopatric models of speciation. However, there have been no studies that have attempted to define the extent and rates of dispersal of mbuna populations in the field. The present work took advantage of some translocations in which several species of mbuna were introduced to the Cape Maclear region of Lake Malawi from elsewhere in the lake. A detailed series of transects involving observations at four depths was undertaken at Thumbi West Island to define the distribution of the introduced species. There are large differences between species in the extent to which they have spread. Some species are now present all round the island while others have dispersed only a limited distance from the site of the initial introductions. This survey provides the first comprehensive data set on the distribution of the introduced species and it raises a number of important questions regarding their dispersal ability and their likely impact on the endemic community.

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Wiksonska, H. 1988. The effect of the introduction of herbivorous fish in the heated Lake Goslawskie (Poland) on the fry of local ichthyofauna. Ekologia Polska 36:275-281.

**Abstract:** Changes in the fry complex were investigated before and after stocking the lake with silver carp (Hypophthalmichthys molitrix val.) and bighead carp (Aristichthys nobilis Rich.). All fish species abundantly and frequently occurring in the lake, except Blicca bjorkna(L.), Leuciscus

cephalus (L.), decreased rapidly in numbers after stocking, whereas species sporadically caught (Cyprinus carpio L., Carassius (L.) disappeared.

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**INTRODUCED FISH SECTION OF THE AMERICAN FISHERIES SOCIETY  
BY LAWS**

**APPROVED 26 AUGUST 1990, AFS EXCOM ANNUAL MEETING, PITTSBURGH PA.**

**Section I. Name**

The name of this organization shall be the INTRODUCED FISH SECTION of the American Fisheries Society as provided for by the Constitution and Bylaws of the Society. In this context the name introduced fish is taken to include fish, shellfish, crustaceans, and other aquatic organisms regulated by fisheries legislation or effecting the well-being of the fisheries resources.

**Section II. Objectives**

The objectives of the Introduced Fish Section are to:

- (a) develop and maintain an association of persons interested and involved in the use of introduced and other aquatic organisms;
- (b) coordinate and develop programs to advance the knowledge and concerns related to introduced species;
- (c) to provide a forum for identifying and bringing attention to bear on the beneficial and potentially harmful impacts of introduced species;
- (d) to encourage communication among scientists, administrators, managers, educators, aquaculturists and others interested in introduced species;
- (e) to assist federal, state and private groups in making informed decisions on introduction of species; and
- (f) to advise private industry in developing procedures for the safe handling of introduced species intended for closed system maintenance and culture.

**Section III. Membership**

Membership in the INTRODUCED FISH SECTION shall be open to all members in good standing of the American Fisheries Society. Each SECTION member is entitled to one vote on all matters requiring the approval of the membership.

**Section IV. Officers**

The officers of the SECTION shall be the President, President-Elect, and the Secretary-Treasurer.

- (a) The President-Elect and Secretary-Treasurer shall be elected for a term of one year or until a successor is elected. The President-Elect shall succeed to the office of President at the expiration of the President's term of office, which is one year. Officers shall serve without salary or other compensation for their services from the SECTION.
- (b) No officers shall hold the same office for two consecutive terms except the Secretary-Treasurer who may hold office for two consecutive terms.
- (c) Candidates for office shall be nominated by a Nominating Committee chaired by the immediate Past-President. Mail balloting shall be completed at least one month before the annual meeting of the SECTION. Officers shall be elected by a majority of the returned mail ballots.
- (d) In the event of a vacated position, the Executive Committee shall appoint a qualified replacement for the unexpired terms.

**Section V. Duties of Officers**

- (a) The President shall serve as chairman of the Executive Committee of the SECTION and shall preside at the business meeting of the SECTION, appoint all committees except Membership and Nominating, and serve as an Ex Officio member thereof. The President shall represent the SECTION and perform other duties and functions as authorized and necessary.
- (b) President-Elect: The President-Elect shall perform the duties of the President in the absence of the President and shall serve as SECTION Membership Committee chairperson and editor of the newsletter to the members in the absence of an appointed Newsletter Editor.
- (c) Secretary-Treasurer: The Secretary-Treasurer shall maintain a current list of the membership, receive all funds, pay all bills, keep an itemized account of all receipts and disbursements, present a semi-annual report to the SECTION Executive Committee and an annual report to the membership. He/she shall submit a report (minutes of the annual business meeting, treasurer's report and membership status) to the Executive Director of the Society within 30 days after the annual meeting of the SECTION is held and at other times as requested by the Executive Committee of the Society.
- (d) Past-President: The immediate Past-President shall serve as the chair person of the Nominating Committee.
- (e) Newsletter Editor: The Newsletter Editor shall prepare the SECTION Newsletter, be appointed by the President for renewable terms of one year, and serve as a non-voting officer of the SECTION Executive Committee.

**Section VI. Meetings**

The SECTION shall hold at least one business meeting annually at a time and place designated by the Executive Committee. Special meetings may be called by the President with the advice and consent of the Executive Committee.

**Section VII. Executive Committee**

Voting members of the Executive Committee shall consist of the current elected officers and the immediate Past-President of the SECTION; the Newsletter Editor will serve as a non-voting member of the Executive Committee. The Executive Committee shall have authority to determine policies and conduct business consistent with the objectives of the SECTION. Meetings of the Executive Committee may be conducted by mail.

**Section VIII. Voting and Quorum**

Decisions at business meetings and the SECTION shall be in accordance with the Constitution of the Society. A quorum at business meetings shall be 15 members of the SECTION.

**Section IX. Fees**

The Executive Committee may assess those attending a meeting of the SECTION a registration fee as provided by the Constitution and Bylaws of the Society. The annual membership fee shall be \$3.00 unless determined otherwise by the Executive committee. Expenses of officers may be defrayed from funds available to the SECTION when authorized by the SECTION Executive committee.

**Section X. Terminology Associated with Introduced Organisms**

In all its written correspondence/documentations, the SECTION shall utilize the terminology defined in "Shafland, P.L. and W.M. Lewis, 1984. Terminology associated with introduced organisms. Fisheries 9(4):17-18".

**Section XI. Amendment of Bylaws**

The Bylaws of the SECTION may be amended by mailed ballot or vote at an annual business meeting and approved by 2/3 of the SECTION members voting on the amendment and by subsequent approval of the Society Executive Committee in accordance with the Constitution and Bylaws of the Society.

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1990-1991 IFS Officers

President: Paul Shafland, Florida Game and Fresh Water Fish Commission,  
801 N.W. 40th Street, Boca Raton, FL 33431 [(407) 391-6409]

President-Elect: Jay R. Stauffer, Jr. School of Forestry, Pennsylvania  
State University, University Park, PA 16802 [(814) 863-0645]

Secretary-Treasurer: Dawn Jennings, USFWS, 7920 N.W. 71st Street,  
Gainesville, Florida 32606 [(904) 378-8181]

Newsletter Editor: Hiram W. Li, Oregon Cooperative Fisheries Research  
Unit, Department of Fisheries and Wildlife, Oregon State University,  
Corvallis, OR 97331 [(503) 737-1963; FAX (503) 737-3590]

Past-President: Peter B. Moyle, Department of Wildlife and Fisheries  
Biology, University of California, Davis CA 95616 [(916) 752-6355]

1991-1992 IFS Officers

President: Jay R. Stauffer, Jr. School of Forestry, Pennsylvania State  
University, University Park, PA 16802 [(814) 863-0645]

President-Elect and Newsletter Editor: Hiram W. Li, Oregon Cooperative  
Fisheries Research Unit, Department of Fisheries and Wildlife,  
Oregon State University, Corvallis, OR 97331 [(503) 737-1963; FAX  
(503) 737-3590]

Secretary-Treasurer: Alexander Zale, Oklahoma Cooperative Fish and  
Wildlife Research Unit, 404 Life Sciences West, Oklahoma State  
University, Stillwater OK 74078 [(405) 744-6342]

Past-President: Paul Shafland, Florida Game and Fresh Water Fish  
Commission, 801 N.W. 40th Street, Boca Raton, FL 33431 [(407) 391-  
6409]